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AUTHOR Boyce, Carolyn M.; Darlington, Richard B.
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ABSTRACT

Arthur Jensen has argued that genetic differences in abstract reasoning ability, not cultural bias in the test item, are the causes of differences in standardized test performance between American Blacks and Whites. He used a study by Frank McGurk to support his argument. McGurk's study used test items judged most cultural or least cultural. These were administered to a sample of pairs of black and white high school seniors matched on age, educational status, and other demographic characteristics. The authors analyzed the McGurk study. They found an analysis of the data demonstrates that black-white differences are constant across the major types of tasks used in tests of mental ability. Abilities tested are association note memory, abstract reasoning and problem solving ability. (DWH)

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BLACK PROFICIENCY IN ABSTRACT REASONING ABILITY

Carolyn M. Boyce and Richard B. Darlington

Cornell University

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Black Proficiency in Abstract Reasoning

Carolyn M. Boyce and Richard B. Darlington

Cornell University

For more than a decade Arthur Jensen (1969, 1972, 1973, 1974, 1975, 1980) has argued that the well-known difference in the standardized test performance of American Blacks and Whites is due not to cultural bias in the test items but rather to genetic differences in abstract reasoning ability in the two groups. To explain data showing negligible black-white differences on some cognitive tests, Jensen postulated the existence of two levels of mental ability which are differentially distributed among races. According to Jensen, those tasks on which black-white differences in performance are small involve the use of Level I abilities--association and rote memory--which are equally distributed among racial groups, while cognitive tasks which produce large black-white differences involve the use of Level II abilities--abstract reasoning and problem solving ability--which are more favorably distributed in the white compared to black population. Jensen further argues that black-white differences on individual IQ test items support this theory. A study by Frank McGurk (1951) which Jensen (1980) stressed heavily as support for his theory was selected to test the abstract reasoning hypothesis.

Procedure and Findings

McGurk (1951) preselected 74 test items that had been judged by a panel of professionals to be either "most cultural" or "least cultural" from a pool of 226 items. These items were then administered to a sample of 213 pairs of black and white high school seniors matched on age, educational status and a variety of other demographic characteristics. He reported the rather sur-

prising finding that black-white differences in the proportion of people passing individual items were largest for the items judged to be "least cultural." Contrary to both McGurk and Jensen (1980), this correlation is an artifact of failing to match cultural and noncultural items for overall difficulty level.

Item difficulty as measured by the proportion of people passing each item in the combined black-white sample correlated .513 across the 74 items with the black-white difference in proportion passing and .273 with the cultural rating of the judges. That is, in the combined sample, 38% of the students passed the "least cultural" items while only 26% passed the "most cultural" items. When the raw proportions are transformed more nearly to an interval scale by means of the logit transformation, the judges' cultural ratings correlated only -.03 with the black-white difference in passing rates. Thus there is no demonstrated relationship between rated cultural loading of an item and black-white difference on that item.

What kinds of items do show the largest differences? Are they Level II items, as Jensen (1980) claims, or do they share some other characteristic? To answer this question, the raw success rates were transformed using the arcsin transformation to eliminate the artifact caused by the fact that raw black-white differences tend to be largest for items with passing rates nearest 50%. The arcsin transformation was selected over other possible transformations because the standard error of an arcsin value is known approximately and thus this transformation allows approximate significance testing. To further remove any effect of item difficulty on black-white differences, simple regression was used to predict the difference between black and white arcsin values from the arcsin transformed difficulty level of the item measured in the combined black-white sample. The residuals in this regression were defined as measures of "adjusted group differences". The 10 items most favorable to Whites (those

items with the largest adjusted differences) and the 10 items most favorable to Blacks (items with the smallest adjusted differences) were selected for content analysis. These items are described in Table 1.

(INSERT TABLE 1 ABOUT HERE)

The items in Table 1 reveal no tendency for Blacks to do especially poorly on items requiring abstract reasoning ability. For example, consider analogies, which are usually accepted as good indicators of abstract reasoning ability. The first item among those most favorable to Whites is a verbal analogy. Yet among the items most favorable to Blacks is a figural analogy. Thus Blacks do not appear especially poor at solving analogies. The verbal analogy problem had by far the largest black-white difference of any item. Yet a Bonferroni analysis found the difference on this item compared to the mean difference on the remaining 73 items to be barely significant ($p = .04$). Similar analyses applied to the remaining items failed to yield significant results. Success on this single item seems to depend largely on the primary meaning one attaches to the word "stillness" --whether it means absence of sound or absence of motion. The child for whom stillness means absence of motion has much less chance of getting this item correct.

The next two items in Table 1 appear to depend equally upon abstract reasoning ability. One is favorable to Whites, the other favorable to Blacks. Items in the third pair also involve similar reasoning processes. Interestingly, the correct response for the item favorable to Blacks--propaganda--was based on an abstract concept while the item favorable to Whites defined a concrete noun--trapeze.

Conceptual similarities in the geometric design problems are less obvious without inspecting the original test. However, the two items favoring Whites

had no single correct answer. Rather a correct response seemed to depend upon a preference for symmetry over other aspects of designs. No such ambiguity was detected in the geometric problem favorable to Blacks.

The items in the sixth pair contrasted in Table 1 are not very similar. Yet both obviously require some ability to reason abstractly. Responses to the "clock" item could be greatly facilitated if the testee were wearing a watch. The last items in Table 1 are also dissimilar. A few algebra items were favorable to Whites, a few vocabulary problems favorable to Blacks. As Table 1 illustrates, the algebra problems appear to require specific school learning more than abstract reasoning ability. Of all these items only the verbal analogy item had a significantly large difference compared to other items.

Our analysis of this study directly refutes Jensen's assertions that black-white differences are largest on items requiring abstract reasoning ability. Indeed, Blacks seem to do especially well on some of these items. This similarity in content between the items least favorable to Blacks and those on which Blacks perform especially well suggests that the variation in adjusted group differences of individual items might be due to change. Using the standard error for an arcsin value it is possible to perform a simple test of this hypothesis. If the $\underline{k}$ test items were independent the test statistic $\sum_{i=1}^{k} (D_i-\bar{D})^2/s.e.^2$, where D_i is the arcsin-based adjusted group difference and s.e. is the standard error of an arcsin difference score, would be distributed as $\chi^2(df=k-2)$. (This is equivalent to dividing the residual variance from the regression of group differences on item passing rates by the squared standard error of an arcsin difference score.) The non-independence of the items makes this test err in the liberal direction, so that any retention of the null hypothesis is a valid

retention. When this test was applied to all 74 items in McGurk the null hypothesis was just barely rejected ($\chi^2(72)=98.25$, $p < .05$). However, just deleting the item on which the largest difference was observed--the verbal analogy described earlier--made the test nonsignificant ($\chi^2(71)=87.71$, $p > .05$). Thus there is no substantial evidence that Blacks do especially poorly on any particular kind of item, including Level II items.

The correlation between the 74 item difficulties for Blacks and the corresponding values for Whites is an additional descriptive measure of black-white differences in the pattern of item difficulties. Across the 74 items in this study the correlation is .978, using the arcsin transformed passing rates. Corrected for attenuation due to sampling error in the observed passing rates, the correlation is .994. Thus the rank order of item difficulties is virtually the same for Blacks as for Whites, especially after correction for attenuation. Any item by group interaction in passing rates would substantially lower the correlation. It is thus simply not true to say, as Jensen (1980) does, that the McGurk data show some items to be especially difficult for Blacks.

Conclusions

In summary, Arthur Jensen selected the McGurk study to support his claims that Blacks do especially poorly on test items that require the use of abstract reasoning ability or problem solving. Our own analysis of these data demonstrate that black-white differences are strikingly constant across the major types of tasks used in tests of mental ability. With respect to the McGurk study, Jensen may be guilty of a Type III error--explaining a phenomenon that does not statistically exist.

6. References:

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Items Most Favorable to Blacks	Items Most Favorable to Whites
* Figural Analogy	** "Sunlight is to darkness as (?) is to stillness"
* Arithmetic word problem involving fractions	Arithmetic word problem involving fractions
* What is the first letter of a word meaning "doctrines or ideas spread by organized effort"?	What is the first letter of a word meaning "a suspended horizontal bar used by acrobats"?
* What is the opposite of "therefore"?	What is the opposite of "always"?
* One geometric design analysis problem requiring a difference judgment.	Two geometric design analysis problems requiring a similarity judgment.
From 4 sentences select the one most similar in meaning to "Every rose has its thorn".	"When the time by a clock was 8 minutes past 10 the hands were interchanged. The clock then said about what time?"
* 4 vocabulary problems	3 algebra problems, including: evaluate $7a^2q + 3a^4p$ if a = 1, p = 3/4 and q = 5.

* Percent Blacks passing the item exceeded percent Whites passing the item (only one of the four vocabulary items).

** Significantly different from the mean of all other items, $p < .05$ with Bonferroni correction.

Table 3. Items from McGurk (1951, pp. 72, 73, 75 for items quoted exactly) with most extreme adjusted group differences.